Application for ASBMB-Accreditation

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Contact Person:

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Introduction:

*The Biochemistry and Molecular Biology (BMB) Major* at [redacted] is a Bachelors of Science degree offered jointly by departments of Biology and Chemistry. It was created in [redacted] using guidelines developed by *The American Society for Biochemistry and Molecular Biology (ASBMB)*, thus ensuring thorough grounding in the discipline. The degree was approved by the [redacted]. The catalog description of the BMB degree and the list of faculty directly involved in the program are included in the *Appendices 1 and Appendices 2 (Table 1)* and 3, respectively. To date, 19 degrees were awarded. Presently, we have [redacted] declared BMB majors [redacted] (*Appendix 4-Table 2*). To further enhance/validate this degree and to raise the profile of the program, we are now seeking the accreditation from the ASBMB.

A. Infrastructure at the Institution:

A.1. Description of Institutional teaching and research facilities:

**Classroom and Laboratory Facilities:** The [redacted] one of the nation's premiere undergraduate science education facilities. The [redacted] project, completed in 2004, included construction of a new, 85,900 square foot building and the renovation of the existing, 72,000 square foot building. The combined structures house the departments of biology, chemistry, geological and environmental sciences, nursing and psychology. Consequently, we have adequate space for holding our classes and laboratories which have been designed to accommodate different size classes. Also, College Advancement helped secure a science equipment endowment of [redacted], the interest of which provides resources to support the upgrade and replacement of scientific equipment. Our teaching labs which can accommodate up to 25 students are dedicated to specific disciplines in biology and chemistry.

The [redacted] is equipped with two general purpose computer labs. These computer labs are available throughout the day, evening, and weekends for research students. The science center also has a Computational Science and Modeling Laboratory consisting of 60-CPU and 480-CPU cluster computers running software packages including Gaussian, AMBER, Gamess, Molpro, WebMO, Aces2, CHARMM, Matlab, Mopac, QChem, and a variety of Bioinformatics software including inquiry and SEED; 15 student PCs, a teacher workstation with SMART board technology, and a 3-D stereo projection system. Each mentor has his/her own college-provided laptop or desktop computer and at last one computer devoted to each faculty member’s research lab. Computers are also available for DNA and protein sequence analysis, statistical analysis, word processing, and WWW access, as are numerous color printers and digital scanners. Numerous computers are available in all biology and chemistry introductory classes to enhance collaborative/team work.

**Research Laboratory Space:** Each faculty member has at least 500 sq. ft. research laboratory with at least one fume hood and access to shared facilities and equipment to support their research activities that include a radioisotope room, autoclave rooms with Amsco autoclaves, and dark room. Each faculty has their own equipment specific to their research needs. In addition to grants awarded
to individual faculty investigators (For specifics please see section B), federal agencies and private foundations support undergraduate research at the departmental and divisional levels.

**Major Instrumentation:** Shared equipment in the two departments includes: Confocal Laser Scanning microscope (Nikon A1), Axiovert Zeiss Fluorescence Microscope with Apotome slider unit, 2 P97-Flaming/Brown micropipette puller, Nakanishi hydraulic micromanipulator, Nikon TE300 DIC Inverted Microscope with DIC and Phase optics, UVP Chemi-Doc Chemiluminescent Detection system, UVP gel documentation system, Chameleon and Victor Microplate readers, scintillation and gamma counters, cell culture incubators, laminar flow cell culture hoods, micro-, clinical-, and refrigerated ultra-centrifuges, DNA sequencer, thermocyclers, electrophoresis and blotting equipment, research microscopes, electronic balances, freezers, microscopes, and water baths, two NMRs (Bruker 400Mhz), UV-visible spectrophotometers, LC/MS (Agilent), IR spectrometers, GC/MS (2), and a peptide synthesizer.

**Animal Facilities:** The department has an animal complex with six rooms. Ventilated cage systems for 150 rats and 150 mice at one time are available. Stainless steel rabbit cages for 6 rabbits, ventilated waste disposal system, aquarium room for amphibians and fish (OLAW on file).

**A.2 Institutional value and support for diversity of faculty and students:**

**College:** Through a variety of approaches, diversity training, workshops, lectures, classroom presentations, interactive programs, films, retreats, conferences and dialogues, OME provides opportunities for students and the campus community to acquire critical cultural competencies needed to build synergistic relationships with people from all backgrounds in order to create a civic and moral community that works for the common good of all. **Leadership Development:** OME utilizes various leadership models to help students develop vital leadership skills needed to thrive in the 21st century; and promotes the values of personal and collective empowerment, equity, social justice, citizenship and service. **Advocacy:** OME conducts research, surveys, focus groups, climate studies, as well as collaborates with college constituents to foster an inclusive and equitable campus community. **Student Support:** OME provides advising, support and mentoring to students in the areas of academic, personal, spiritual financial and career development. **Student Organizations:** OME provides advisory and leadership support to multicultural leadership organizations, including Black Student Union, Asian Perspective Association, Latino Student Union, Theta Gamma Pi, Delta Sigma Theta Sorority, Inc., and Delta Kappa.

**Division:** (FACES) program was started in 2010 with funds from to help underrepresented students enrolled in STEM programs to succeed.

"The mission of
Department of Chemistry: The National Science Foundation Research Experiences for Undergraduates (REU) program in the Chemistry at [redacted] seeks to serve underrepresented minorities and two-year college students, both underrepresented populations in chemistry. Students in this program are recruited through the NSF REU website, through electronic mailings to colleges and universities with high populations of underrepresented students and to two-year colleges. Recruitment is also completed through joint efforts between [redacted] that train two-year college students for research experiences. In the 2010-2012 REU funding period there were [redacted] participants. All [redacted] were either underrepresented minorities, 2-year college students or both. In the cohort, [redacted] were underrepresented minorities, [redacted] were two-year college students and [redacted] of the two-year college students were nontraditional college students.

Department of Biology: The Biology department is also an avid supporter of initiatives to increase the number of individuals of underrepresented populations in STEM fields. We support this through established divisional programs such as mentoring high school students through REACH, community college transfer students through S-STEM and support of FACES students and program. Departmental initiatives center on summer research opportunities; we actively recruit students of underrepresented groups to participate in our research program. In classes, one consideration in the admission process to the Honors Lab in Phage Genomics is to increase diversity in science. Biology Faculty and students participate in the [redacted] Program, involving students and teachers from 4 urban high schools in the [redacted] area. One of the stated goals of this program is to expose participating high school students, who are primarily members of underrepresented groups, to opportunities at the independent colleges of [redacted], including visits to and research affiliated with [redacted]. During the past [redacted] summers, [redacted] students belonging to minority groups (as defined by NSF) participated in the summer research program in Biology with support from the NSF REU grant. All BMB-involved faculty (biology and chemistry) mentor underrepresented students both during the academic year and in the summer.

A.3. Information resources and Library Facilities: Information Technology: Department of Computing & Information Technology (CIT) supports the entirety of academic, instructional, research, and administrative efforts for the campus community. Comprised of [redacted] staff members, CIT's relationship-driven model emphasizes individual attention to constituent needs as well as inter-departmental collaboration. With an inclusive "end-to-end" charge, the Department facilitates all aspects of desktop/mobile computing, servers, programming & ERP, networking, telecommunications, imaging/printing, and audio/visual. Staff with expertise in project management, process design, and business intelligence are also available to the campus community. Specific to the areas of Biochemistry and Molecular Biology, CIT provides:

- Operational and technical support for all aspects of office, classroom, and computer lab resources;
- Day-to-day operational and long-term management of the College's high-performance scientific computing clusters;
• Customized delivery of institutional data to facilitate faculty administrative processes such as student advising, research management, and facilities scheduling;
• Tailored programs to support the specific instrumental and computational needs of individual faculty members;
• A Help Desk, staffed exclusively by professionals, providing resolution and escalation services to student and faculty via phone, email, and in person.

**Library:** Library supports the Biochemistry and Molecular Biology major by providing access to up-to-date information sources for students and faculty. Included in these resources is electronic access to 185 biochemistry journals, as well as electronic access to 56 molecular biology journals. This access is provided via subscriptions to well-known scientific publishers including Elsevier, Springer, Wiley-Blackwell, Oxford, the American Chemical Society, and the American Society for Biochemistry and Molecular Biology. In addition to subscribing to individual titles and large journal packages, the library provides per-article access to Elsevier journals via ScienceDirect ArticleChoice. The Library also provides access to hundreds of e-books in the subjects of biochemistry and molecular biology. These books are available 24/7 through the library’s online catalog. The major vendors of e-books include ebrary (an aggregator of many publishers) and Springer. All faculty have the opportunity to order books they would like added to the collection.

Library, winner of the Association of College and Research Libraries Excellence in Academic Libraries award as well as the Citation of Excellence from the Library of is housed in an architectural award-winning building. It is open to the campus community 96 hours per week and provides research assistance during most hours. This research assistance is provided in person, through individual research appointments, e-mail, chat, and text services with reference librarians. The five floors provide ample seating and study spaces for students, whether they are working on group projects or studying individually.

**A.4. Professional Development for the Faculty (including Faculty directly involved in BMB Program):** Rationale and Responsibility for Professional Growth can be found in faculty handbook (Professional Obligations of Faculty: Professional Growth) and on Provost’s website. Faculty members are expected not only to promote intellectual inquiry by their students, but to illustrate it continually in their own behavior. Scholarly growth is essential for good teaching, and it is therefore a significant criterion for promotion and tenure. Every faculty member is responsible for designing his/her own program of professional development in consultation with the departmental chairperson. The principal goals of any such program are the maintenance of vitality in teaching and the fostering of growth as a professional in his/her area(s) of scholarly interest and expertise.

**Internal Resources Available to Faculty to Assist in Growth:** To assist each faculty member in realizing these goals, the College provides various forms of assistance. Included are: The program for new faculty, which includes an August workshop, fall and spring semester seminars, a spring retreat, and a mentoring component. Participation by all new full-time faculty is expected. Some components are also open for participation by continuing faculty. The sabbatical leave program is available every six years for at least half year to all faculty. Funds to enable travel to professional conferences and Summer development grants to assist research and other forms of
faculty development are also available through Provost’s office. President's Discretionary Fund, available year-round for special projects; Faculty study carrels in [redacted], assigned by the Library Committee for a semester or summer through an application process; Colloquium series and short-term workshops organized within departments, divisions, or special groups such as the Senior Seminar faculty; Funds to enable attendance at meetings aimed at the improvement of teaching (e.g., GLCA Workshop on Course Design and Teaching). Several departmental and divisional offices regularly post announcements of conferences and of grant and fellowship competitions.

**External Funding for Scholarly Work:** Since the resources of the College are insufficient to support all scholarly work by faculty members, individuals are encouraged actively to seek funds from outside sources, especially to sustain their scholarly work on an ongoing basis. The Office of Sponsored Research Programs (SRO) provides assistance to faculty in locating funding sources and developing successful proposals through a variety of services provided. It is important for faculty members to contact the Director of Sponsored Research Programs as well as their Chairperson and divisional Dean to enlist their assistance in formulating grant requests. There are college requirements related to submitting an external grant proposal such as completion of the online “Early Notification Form” informing the SRO and Chairperson of the faculty member’s intentions, paper copies of the “External Support Routing Form” seeking authorizations by designated College officials prior to submission and the “Institutional Cost Share Form”, if College commitments are required for the project.

**A.5. Course Availability:** _timing and capacity:_ Our students are assured a spot in a classes needed to complete their major on time. The frequency of course offerings is listed in the College catalog. Most courses are offered on a regular basis in the spring or fall semester of each academic year. Some courses are offered in alternating years, such as the spring semester of even years. Since this information is published in the College Catalog, students can use this information to plan their sequence of courses and be assured that they will be offered as listed in the Catalog. While the Department has a goal of maximum [redacted] every effort is made to accommodate student demand to enroll in courses. For lecture courses there is some flexibility to have enrollments slightly over the maximum, but if there is a greater demand the College will provide support to offer an additional section of the course with comparable enrollments in both sections. In the case of laboratory courses where enrollment limits are fixed by the number of seats in a lab, an additional lab section will be offered to meet the enrollment demands. The Department is cognizant of the importance of completing the degree within a four year plan and works with students to achieve this objective. All students meet every semester with their advisors to ascertain that they are enrolled in appropriate courses. In addition, all BMB majors meet with the BMB director to ascertain their appropriate placing in courses needed to complete this degree.

**A6. Safety Infrastructure:** Both departments (and division) have established safety rules and emergency reporting procedures. We have a written _Chemical Hygiene Plan and Safety Information_ and reference materials (MSDS) readily available to all students and faculty. Personal protective equipment is available and used by all students and faculty. We have the following
positions dedicated to safety: Directors of Chemistry and Biological Laboratories; Safety Director; Radiation Safety officer; Animal Care and Use Committee; and Human Subjects Review Board. The institution provides the faculty and students access to its safety policies and procedures on each of the respective websites as well as the department and Sponsored Research websites.

For independent research (both during the academic year and during summer research program) there is annual safety and hygiene training required of all students and mentors (including BMB). Specific lab safety protocols are responsibility of each PI and the hazardous activities are written up and posted in each lab. Chemical safety Officer performs annual review of all safety rules. In addition, the institution has a subscription to the CITI – Collaborative Institutional Training Initiative at the University of Miami which provides online certifications on Biomedical Responsible Safety programs as it relates to BMB faculty and students: Conduct of Research (RCR), Human Research [biomedical research, social/behavioral research], Conflicts of Interest (COIO) and Working with Zebrafish. The COI certifications are required for all NSF and NIH applicants.

A7. Other faculty and key personnel: We have [redacted] secretary in biology and [redacted] chemistry who support our BMB faculty without restrictions. We have a lab director in each department and we have introductory lab coordinator for organic chemistry and one for introductory chemistry laboratories. We also have machine and electronic shop with full time technician; animal care and greenhouse workers; general student departmental assistants; and access to faculty in other science departments. All individuals are available on an as-needed basis for all the faculty.

Faculty:

B.1. Educational Credentials and Scholarly Accomplishments of Faculty participating in the delivery of BMB bachelor’s degree: [redacted] is a distinguished liberal arts undergraduate college known for excellence in sciences (1-3). In the 2012-2013 academic year, there were [redacted] full-time faculty in the natural science (NAS) Division at [redacted]. Of these, [redacted] have tenure, [redacted] are tenure track, and [redacted] have term appointments of 1 year or greater. Of the NAS faculty, [redacted] are actively engaged in collaborative research with students including off-campus students conducting summer research. All faculty is involved in providing educational opportunities for our majors, including the new BMB majors. In chemistry and biology departments we have [redacted] full-time (tenured and tenure-track) faculty, respectively. Faculty in both departments contributes towards the delivery of the BMB degree. The broad research interests and activities of the faculty participating in the BMB program at [redacted] College as summarized in their CVs and Faculty Table in Appendices 2 and 3, respectively. The roster includes both, established faculty with the experience of working with hundreds of undergraduates in a broad range of disciplines, and several untenured faculty members who have only begun to realize their potential influence of their research and mentoring activities. They include [redacted] full-time tenured and [redacted] full-time non-tenured biochemists, [redacted] molecular biologists, [redacted] microbiologist, developmental and plant biologists, and physical chemist. [redacted] Overall, all faculty involved in research dedicate approximately [redacted] of their effort to this specific program.
B.2 Scholarship and Publication Record of Science Faculty: A successful undergraduate research program is sustained by hiring faculty who are equally committed to educating students through research and to their own scholarly growth. Hiring decisions at [university name] are made with the expectation that new faculty members could be successful at the university level but choose to establish a teaching and research career at a college. An important component in tenure decisions is the quality and productivity of student-faculty research. The institution recognizes that our active collaborative research and teaching model requires that faculty members be given time reassigned from teaching to conduct research with students. Faculty regularly disseminate their results through invited seminars, talks at regional and national meetings, and published manuscripts. Since faculty are equally committed to scholarship and teaching, they demand that their research students participate in all aspects of a research program including research design, on-campus seminar presentations, oral and poster presentations at scientific research symposia, and ultimately preparation and submission of manuscripts. The quality of research programs is extremely high, as judged by the publication record of the faculty. For example, [example of publication].

As a further illustration of the influence of these works, the published research of the current faculty has been cited a total [citation count] times in the last 5 years (5). A total of [number of students] students have coauthored these papers. At a national level, BMB faculty have actively contributed for many years to various programs within ASBMB.

B.3. Recognition of Faculty Excellence through Nationally Competitive Funding: Long-term strength in research is evidenced by its record of success in attracting external support for its research programs. The submission of proposals is informally rewarded at time of submission, tangibly rewarded in annual evaluations, and the receipt of grants is applauded at college-wide recognition ceremonies. Currently, [funds] students
for three years to conduct research during academic year and two summers (Five of the BMB majors to date have been recipients of this award).

B.4 Recognition of Faculty Excellence through Career Teaching/Research Excellence Awards and Honors: All tenured faculty are eligible for one-year sabbatical leave opportunities every 6th year. All pre-tenure faculty can compete for an internal pre-tenure one-semester sabbatical opportunity in their third year (Towsley award). All faculty receive teaching enhancement workshop during the first year. All faculty receive a faculty mentor (from outside the department) in years 2 and 3. All faculty receive travel support for professional travel.

B.5 Diversity of faculty and breadth of faculty scholarship and research: The mentoring experience of participating faculty members varies from only four students for new faculty members to well over one hundred for more experienced faculty. Since 2009, faculty participating in the BMB program, have a very diverse background and have mentored a total of undergraduate research students (Appendix 2 - Table 1). It should also be noted a significant majority of all graduate school bound students (all who have graduated with the BMB major) have experience in the research groups of the faculty representing broad areas of biochemistry, biology and chemistry. Undergraduate research at is carried out in the setting of a strong and supportive natural science community. A key factor in the program is the close professional partnership between the student and faculty member. At, the faculty mentor works side-by-side in the laboratory with the student, resulting in extensive informal student-faculty interaction and enabling the student to quickly build self-confidence in the research endeavor. The mentor guides the student in all aspects of the scientific process, including literature searches, experimental design, utilization of scientific equipment, carrying out experiments, and interpreting.
results. The mentor also assists the student in professional development, including giving course advice, discussing career path options, and introducing students to key individuals at graduate institutions. Faculty mentors play the lead role in training students to effectively communicate their research results through regular group meetings, weekly student research seminars in the summer, presentations at off-campus research symposia, poster preparation, and manuscript writing. Student attendance at national meetings with their mentors is a College priority, and over the last 5 years about research students working with the participating faculty took advantage of opportunity to present off campus, averaging presentations per year. All students who graduated with the BMB major were involved in research.

B. Curriculum:

C.1. Educational goals for BMB majors and overall educational approach/philosophy (one page): In the past, at, like most other institutions, we have separated the two sister disciplines into molecular biology (in the Biology Department) and biochemistry (in the Chemistry Department). Chemistry also offers the American Chemical Society-certified Biochemistry Degree. This historical division of the disciplines is an artifact of the origins of the sciences involved, and the nature of higher education hiring practices. The hiring of professors into two biochemistry positions shared jointly between the Biology and Chemistry departments, has facilitated the gradual breakdown of this separation. The two departments have worked extensively together, in the spirit of genuine collegiality, in order to provide our students with the best possible education in developing this proposed major. A task force consisting of a group of biologists, chemists and biochemists came together regularly to discuss development of a joint major in Biochemistry and Molecular Biology to serve our students. All members of each department examined the proposed degree separately in department meetings and jointly in a combined Biology/Chemistry meeting. After several years of careful study and collaborative effort, the result was development of this proposed major, which reflects the true interdisciplinary nature of the Biochemistry/Molecular Biology field. The proposed major was created using guidelines developed by the ASBMB for educating undergraduate students (See Appendix 5).

In addition, the course work in the proposed major in Biochemistry and Molecular Biology reflects the spirit of Bio2010, an influential report from the National Research Council of the National Academies which strongly advocates the development of interdisciplinary endeavors in the training of science majors, and the communication of the excitement of science to the undergraduate student, through relevant laboratory exercises and independent research.

The task force for the BMB degree discussed the vision and objectives for the proposed major, and examined which of our courses would provide the knowledge and skills described in the ASBMB guidelines, and if any new classes would be required to complete the major. As a result of these
conversations, the task force developed the following vision for a biochemistry and molecular biology major at [Name of Institution]: The Biochemistry and Molecular Biology Major will prepare our students for a technical career, advanced study or professional school with a solid grounding in both Biology and Chemistry. The degree is a collaboration of effort between the two departments, and takes advantage of our current strengths in these areas. All students in this B.S. program will take a common set of core courses in chemistry, biology, math, and physics, and choose from a set of electives in Chemistry or Biology.

C.2 Curriculum for BMB majors and its relevance to the core concepts: Having the student learning objectives for each course listed (Appendices 5B and 6) has helped us compare courses to make sure that (a) no fundamental skill is being overlooked because we thought another course was covering it and (b) to reduce the number of times the same skills are being taught in different courses to the same students. We have revised the general chemistry and biology curricula extensively as a result of this analysis. The requirements for the biochemistry program are outlined in Appendix 5B. To help our students with appropriate selection of courses required for the degree, we offer a “suggested” course sequence (Appendix 7). The specific correlations between our required courses and core concepts listed by the ASBMB are summarized in the ASBMB-Table - Appendix 9.

We believe that this proposed sequence of courses students will obtain an understanding of the fundamental principles of biochemistry and molecular biology. Students will be able to develop hypotheses, design and carry out experiments, and interpret the results for a question related to a biochemical and molecular biological research project. Students will have opportunities to pursue undergraduate research in the Biology and Chemistry departments, allowing students to gain skills and knowledge essential to prepare future scientists. Students will have opportunities to interact “one-on-one” with their professors, use “state-of-the-art” technologies, and present their work at the national meeting of Biochemistry and Molecular Biology. Students will be prepared for graduate study in Biochemistry, Molecular Biology, and related fields, or entry into technical careers. Students will learn the concepts and skills required to be successful scientists in the field. Students will receive excellent preparation for professional degrees, such as medicine, dentistry or veterinary science.

C.3. STEM Experiential Learning: The BMB major experimental learning (laboratory and research) component gives our students over 468 hrs of laboratory learning (see Appendix 6. As can be seen in Appendix 6, students receive 42 hours of experiential learning through each structured laboratory course. In addition, Independent Research and internships, provides them with opportunity to do independent research (see above). Internship in Chemistry program provides chemistry training and skill development for the student. This is usually done off-campus and the student must work under the supervision of a qualified scientist. Written reports appropriate to the internship experience are required throughout the semester. Students must consult the faculty supervisor to inquire about the process of identifying an appropriate internship and then complete the “Permission to Register for An Academic Internship” form.
C.4 Undergraduate research opportunities at [ ]: Historic: [ ] is a distinguished liberal arts undergraduate college known for excellence in sciences. On average, each department has [ ] graduating majors per year. Importantly, the [ ] faculty and administration are convinced that the training of future scientists is best achieved through a research-rich curriculum built upon faculty-student collaborative research. The typical student is involved in research for two or three years, including summers. The research culture at [ ] is sustained entirely by student-faculty interest in the research enterprise, without any formal curriculum requirement for student research. [ ] commitment to undergraduate research has been nationally recognized. Over the past 5 years, the Chemistry Department has involved an average of [ ] in research each summer and approximately [ ] students in academic year research. Similarly, the Biology Department has involved an average of [ ] in research each summer and [ ] students in academic year research. In 2011, as part of the National Undergraduate Research Week celebration, [ ] was chosen to host a complimentary webinar entitled, “Transformational Learning through Undergraduate Research and Creative Performance,” sponsored by the Council on Undergraduate Research. In 2010 Fiske Guide to Colleges included [ ] as one of the country’s best and most interesting schools (1).

Current: In the 2012-2013 academic year, there are [ ] full-time faculty in the NAS (natural science) Division at [ ]. Of these, [ ] tenure, [ ] tenure track, and [ ] have term appointments of 1 year or greater. Of the NAS faculty, [ ] actively engaged in collaborative research with students including off-campus students conducting summer research. All BMB majors have been actively involved in our research program, both during the school year and in the summer.

C5. Promotion of communication skills (written and oral) via BMB: Communication skills are fostered throughout our curriculum in Biology and Chemistry. During the academic terms, various courses incorporate all these features as part of the syllabus and they are defined as student outcomes - especially problem-solving, communication, and teamwork. At the junior/senior level, for example, BMB majors are expected to work in teams for oral presentations in Biochemistry II, written reports in Molecular Biology and weekly oral presentations in physical Chemistry. All lab component’s require extensive team work and reporting including students in the Biochemistry
Lab. In addition, students taking Neurochemistry and Disease are required to write multiple drafts of a 20 page scientific review. During summer the weekly meetings focus on scientific writing for both scientific and general audiences. Students are required to progressively write a preliminary draft of each section of a research manuscript for their own research over the summer. The research supervisor will be responsible for continual editing of the writing in progress. The final goal is to prepare a formal scientific paper. Each student will submit a paper and an electronic copy of a formatted manuscript to the Project Director. Similar protocols are followed in the independent research courses during the academic year.

C.6. Promotion of teamwork skills: During the academic terms, various courses incorporate all these features as part of the syllabus and they are defined as student outcomes - especially problem-solving, communication, and teamwork. In addition, career guidance and advising sessions are held for majors. CV writing and career, workshops, visits to local employers, and a required oral and poster presentation for all students. For the formal oral presentations at the end of the summer, each student teams will have 12 minutes for presentations and 3 minutes for questions and answers. Students are required to use computer presentations for these talks. BMB club (started in 2011) (Appendix 8) is also very active in team building activities that include outreach to local schools and interaction/assistance with our on campus “CASA” program which focusses on the afterschool academic assistance for underrepresented minorities.

C.7. Programs and resources for academic advising: Professional Obligations of Faculty include Advising Responsibilities (Also addressed in A4). After the first year of teaching at [Institution Name], faculty members participate in the academic advising of students. The instructor of a First-Year Seminar [Section] section serves as the academic advisor for students enrolled in his or her section, and continues to advise these students until they select a major, normally by the end of the sophomore year, and have been assigned an advisor by the major department. If advisees have major academic problems,
These special services are available:

All our students meet with their academic advisors before registration. All declared BMB majors meet with the BMB program director to discuss their schedule and career choices. Students get personal advising on graduate school programs and job opportunities relevant to specific field, including BMB.

C.8. Internal assessment methods used by the program to evaluate student performance: Evaluation of the program by faculty is an ongoing process. We discuss aspects of the program that works and devise strategies for improving our program. We have agreed that this rigorous program works well and serves our students well. In each course, there is a required assessment of course objectives (SALT) by all students for each course. A summary of the course outcomes for each department is returned to the department each semester.
C.9. **Assessment of the degree program:** In [Year], the Chemistry department conducted a full Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis as part of our ongoing curriculum revision discussions. This resulted in a 16-page report plus a 22-page student learning objectives summary for each course offered by the chemistry department that included our biochemistry programs.

C.10. **Promotion of ethical conduct of research and scholarship:** Students at U [University] are regularly engaged in the discussion of “ethical conduct” in science as they are exposed to the discussion of the ethical issues in science as they progress through their chosen major. We also offer a Senior Seminar – Science and Human Values [Seminar Name] entitled Bioethics and genetic engineering of humans, other animals, and plants: This course addresses ethical questions in the context of science/technology, politics/public policy, cultural diversity, and faith and is open to all seniors with no science background required.

During summer research, there are required sessions/workshops on ethics offered through both departments. **Chemistry:** All the research students are required to attend two meetings in the summer to address scientific ethics as part of their summer research contract. These meetings were held outside of regular work hours and the first short meeting outlined the need for ethics training and distributed eight written "case students" compiled from ACS and APS websites on scientific ethics. They were asked to prepare a response to two of the case studies as "homework" over the next week which had to be uploaded electronically. The follow-up hour-long meeting held a week later broke the students into groups of 6 - 8 students with one faculty member per group to discuss their responses to the two cases, and to submit a modified handwritten response after the group discussion. Topics for the cases included conflict of interest, publishing and co-authorship, larger societal issues, individual and group responsibilities and bias in the workplace. The exercise was assessed by the students and will be continued in future summers. **Biology:** Students are presented with a “real life “ scenarios of ethical issues in a team For example, The session on scientific ethics is designed to be a formal addition to the ethical discussions that faculty mentors have within their own research programs. Using scenarios directly related to the types of research students are doing, students and faculty will be asked to describe what they would do in each situation followed by a general discussion with the faculty of the ethical problems presented and possible solutions. An example of such scenarios used previously is: Your research supervisor is up for tenure and has just submitted a manuscript that will probably ensure that tenure is awarded. You know, however, that
the one of the graphs in the manuscript is based on faulty, if not fraudulent data. What should you do? Consideration of the use and misuse of the scientific evidence for government organization/community policy decisions using examples provided by the research supervisors will also occur at this weekly meeting setting.

**Conclusion:** We believe that the Biochemistry and Molecular Biology Major will prepare our students for a technical career, advanced study or professional school with a solid grounding in both Biology and Chemistry. Achieving the accreditation from the ASBMB would significantly raise the profile of this demanding program that is increasingly popular with our students. Further, it would affirm to the prospective graduate and professional schools and future employees the validity of the scientific education achieved by our students. We thank this committee for reviewing our application.